1. A compact gas burner apparatus having a short flame length and a high turndown ratio for discharging a mixture of fuel gas and air into a furnace space wherein the mixture is burned and flue gases having low NO_x content are formed therefrom comprising:

a housing having an open end attached to said furnace space;

means for introducing a controlled flow rate of said air into said housing attached thereto;

a burner tile attached to the open end of said housing having an opening formed therein for allowing said air to flow therethrough and having a wall surrounding said opening which extends into said furnace space, the exterior sides of said wall being divided into sections by a plurality of radially positioned baffles attached thereto with alternate sections having different heights and slanting towards said opening at different angles and one or more of the alternating sections having primary fuel gas passageways formed therein for conducting primary fuel gas from outside said section to within said wall;

a plurality of fuel gas nozzles connected to a source of fuel gas and positioned outside said wall of said burner tile for discharging secondary fuel gas adjacent to said external slanted wall sections with one or more of said fuel gas nozzles also discharging primary fuel gas mixed with flue gases into and through said primary fuel gas passageways whereby said secondary fuel gas mixes with flue gases in said furnace space, the mixture of secondary fuel gas and flue gases mixes with unburned air, primary fuel gas and flue gases flowing through said opening and wall of said burner tile, and the resultant mixture is burned in said furnace space; and

said one or more of said alternating sections with primary fuel gas passageways formed therein having one or more deflectors attached thereto for deflecting the secondary fuel gas into separate streams that do not interact with each other.

2. The burner apparatus of claim 1 wherein said radially positioned baffles attached to said burner tile extend in directions parallel to the axis of said burner tile wall whereby said secondary fuel gas and flue gases are divided into a plurality of separate streams which mix with said primary fuel gas and unburned air flowing through said opening and wall of said burner tile.

3. The burner apparatus of claim 1 wherein a first of said alternating wall sections has a short height and slants towards said opening in said burner tile at a large angle, the second of said wall sections has the same or a taller height and slants towards said opening at the same or a smaller angle and successive alternating sections have heights and angles which are the same as said first and second sections.

4. The burner apparatus of claim 3 wherein said first of said alternating sections have heights in the range of from about 0 inches to about 16 inches and slant towards said opening at an angle in the range of from about 0 degrees to about 90 degrees, and the second of said alternating sections have the same or different heights as the first of said alternating sections in the range of from about 2 inches to about 16 inches and slant towards said opening at the same or different angles in the range of from about 0 degrees to about 60 degrees.

5. The burner apparatus of claim 3 wherein said first of said alternating sections have heights in the range of from about 5 inches to about 10 inches and slant towards said opening at an angle in the range of from about 10 degrees to about 30 degrees, and the second of said alternating sections have the same or different heights as the first of said alternating sections in the range of from about 6 inches to about 12 inches and slant towards said opening at the same or different angles in the range of from about 5 degrees to about 15 degrees.

6. The burner apparatus of claim 3 wherein said first of said alternating sections have heights of about 7 inches and slant towards said opening at an angle of about 20 degrees, and the second of said alternating sections have heights of about 9 inches and slant towards said opening at an angle of about 10 degrees.

7. The burner apparatus of claim 3 wherein said passageways are located in said slanted wall sections which have short heights and slant towards said opening in said burner tile at large angles, said passageways being positioned whereby primary fuel gas discharged from said fuel gas nozzles mixes with flue gases and flows through said passageways into the interior of said wall of said burner tile wherein the mixture mixes with air.

8. The burner apparatus of claim 1 wherein said burner tile, said opening therein and the interior of said wall of said burner tile are substantially circular, rectangular, square, triangular, polygonal or other shape.

9. The burner apparatus of claim 1 wherein said open end of said housing is circular, square, triangular, polygonal or other shape and said housing is cylindrical, square, rectangular, triangular, polygonal or other shape.

10. The burner apparatus of claim 1 which optionally further comprises a primary fuel gas nozzle connected to a source of fuel gas positioned within said opening and wall of said burner tile for mixing additional primary fuel gas with said air flowing through said burner tile and discharging the mixture into said furnace space.

11. The burner apparatus of claim 10 which optionally further comprises a venturi positioned around and above said additional primary fuel gas nozzle.

12. The burner apparatus of claim 1 which optionally further comprises a flame stabilizing surface within said opening of said burner tile.

13. The burner apparatus of claim 2 wherein said separate streams of secondary fuel gas and flue gases mixed with said unburned air and primary fuel gas are burned in said furnace space in a folded flame pattern which produces flue gases having low NO_x content.

14. The burner apparatus of claim 1 wherein said one or more deflectors attached to said alternating sections with primary fuel gas passageways formed therein are one or more deflector blocks of various shapes including triangular, rectangular, square and trapezoidal.

15. The burner apparatus of claim 14 wherein said one or more deflector blocks are of triangular shapes positioned with the bases thereof coinciding with the tops of said alternating sections with primary fuel gas passageways therein and the apexes thereof pointing towards the passageways formed therein.

16. The burner apparatus of claim 14 wherein one deflector block is attached to each of said alternating sections with primary fuel gas passageways formed therein.

17. The burner apparatus of claim 14 wherein two or more deflector blocks are attached to each of said alternating sections with primary fuel gas passageways therein.

18. The burner apparatus of claim 1 wherein said fuel gas nozzles are each connected to a source of fuel gas by separate conduits having shut-off valves disposed therein whereby said fuel gas to one or more fuel gas nozzles can be shut off when required.

19. A compact gas burner apparatus having a folded flame pattern, a short flame length and a high turndown ratio for discharging a mixture of fuel gas and air into a furnace space wherein the mixture is burned and flue gases having low NO_x content are formed therefrom comprising:

a housing having an open end attached to said furnace space;

an air register for introducing a controlled flow rate of air into said housing attached thereto;

a burner tile attached to the open end of said housing having an opening formed therein for allowing said air to flow therethrough and having a wall surrounding said opening which extends into said furnace space, the exterior sides of said wall being divided into sections by a plurality of radially positioned baffles attached thereto, a first of said alternating wall sections having a short height and slanting towards said opening at a large angle, the second of said wall sections having a taller height and slanting towards said opening at a smaller angle and successive alternating sections having heights and angles which are the same as said first and second sections, every other of said slanted wall sections also having passageways formed therein for conducting primary fuel gas and flue gases into the interior of said wall;

a plurality of fuel gas nozzles connected to a source of fuel gas and positioned outside said wall of said burner tile for discharging secondary fuel gas adjacent to said slanted wall sections whereby said secondary fuel gas mixes with flue gases in said furnace space, a portion of said fuel gas nozzles discharging primary fuel gas mixed with flue gases through said passageways in said slanted wall sections into the interior of said burner tile wherein said primary fuel gas and flue gases mix with air therein and the resultant mixture of unburned air, primary fuel gas and flue gases flowing through said opening and wall in said burner tile mixes with said secondary fuel gas mixed with flue gases and the resultant mixture is burned in said furnace space in said folded flame pattern; and

said slanted wall sections with passageways formed therein having one or more deflectors attached thereto for deflecting the secondary fuel gas into separate streams that do not interact with each other.

20. The burner apparatus of claim 19 wherein said radially positioned baffles attached to said burner tile extend in directions parallel to the axis of said burner tile wall whereby said secondary fuel gas and flue gases are divided into a plurality of separate streams which mix with said primary fuel gas and unburned air flowing through said opening and wall of said burner tile.

21. The burner apparatus of claim 19 wherein said first of said alternating sections have heights in the range of from about 0 inches to about 16 inches and slant towards said opening at an angle in the range of from about 0 degrees to about 90 degrees, and the second of said alternating sections have the same or different heights as the first of said alternating sections in the range of from about 2 inches to about 16 inches and slant towards said opening at the same or different angles in the range of from about 0 degrees to about 60 degrees.

22. The burner apparatus of claim 19 wherein said first of said alternating sections have heights in the range of from about 5 inches to about 10 inches and slant towards said opening at an angle in the range of from about 10 degrees to about 30 degrees, and the second of said alternating sections have the same or different heights as the first of said alternating sections in the range of from about 6 inches to about 12 inches and slant towards said opening at the same or different angles in the range of from about 5 degrees to about 15 degrees.

23. The burner apparatus of claim 19 wherein said first of said alternating sections have heights of about 7 inches and slant towards said opening at an angle of about 20 degrees, and the second of said alternating sections have heights of about 9 inches and slant towards said opening at an angle of about 10 degrees.

24. The burner apparatus of claim 19 wherein said burner tile, said opening therein and the interior and said wall of said burner tile are substantially circular, rectangular, square, triangular, polygonal or other shape.

25. The burner apparatus of claim 19 wherein said open end of said housing is circular, square, triangular, polygonal or other shape and said housing is cylindrical, square, rectangular, triangular, polygonal or other shape.

26. The burner apparatus of claim 19 which optionally further comprises at least one primary fuel gas nozzle connected to a source of fuel gas positioned within said opening and wall of said burner tile for mixing additional primary fuel gas with said air flowing through said burner tile and discharging the mixture into said furnace space.

27. The burner apparatus of claim 19 which further comprises a venturi positioned around and above said primary fuel gas nozzle.

28. The burner apparatus of claim 19 which further comprises a flame stabilizing surface within said opening of said burner tile.

29. The burner apparatus of claim 19 wherein said one or more deflectors attached to said alternating sections with primary fuel gas passageways formed therein are one or more deflector blocks of various shapes including triangular, rectangular, square and trapezoidal.

30. The burner apparatus of claim 29 said one or more deflector blocks are of triangular shapes positioned with the bases thereof coinciding with the tops of said alternating sections with primary fuel gas passageways therein and the apexes thereof pointing towards the passageways formed therein.

31. The burner apparatus of claim 29 wherein one deflector block is attached to each of said alternating sections with primary fuel gas passageways formed therein.

32. The burner apparatus of claim 29 wherein two or more deflector blocks are attached to each of said alternating sections with primary fuel gas passageways therein.

33. The burner apparatus of claim 19 wherein said fuel gas nozzles are each connected to a source of fuel gas by separate conduits having shut-off valves disposed therein whereby said fuel gas to one or more fuel gas nozzles can be shut off when required.

34. A method of discharging a mixture of fuel gas and air into a furnace space by way of an opening therein wherein said mixture is burned in a folded flame pattern and flue gases having low NO_x content are formed therefrom comprising the steps of:

(a) discharging said air into a mixing zone within and adjacent to a wall which extends into said furnace space and has exterior sides divided into alternating sections by a plurality of radially positioned baffles attached thereto, the alternating sections having different heights and slanting towards said opening at different angles and one or more of the alternating sections having passageways formed therein for conducting a primary fuel gas and flue gases mixture from outside said section to within said wall;

(b) discharging a primary portion of said fuel gas from locations outside said wall and adjacent to said one or more wall sections having passageways formed therein so that said primary portion of said fuel gas is mixed with flue gases in said furnace space and the resulting primary fuel gas-flue gases mixture formed flows into said mixing zone within said wall by way of said passageways to form a primary fuel gas-flue gases-air mixture which flows into said furnace space; and

(c) discharging a secondary portion of said fuel gas from two or more locations outside said wall and adjacent to two or more of said wall sections having different heights so that said secondary portions of fuel gas mix with flue gases in said furnace space and the secondary fuel gas-flue gases mixtures formed are discharged into said primary fuel gas-flue gases-air mixture in two or more separate streams

formed by said radially positioned baffles which enter and mix with said primary fuel gas-flue gases-air mixture to form a highly mixed fuel gas-flue gases-air mixture which burns in said folded flame pattern, the one or more wall sections with passageways formed therein having one or more deflectors attached thereto for deflecting the secondary portion of the fuel gas into separate streams that do not interact with each other.

35. The method of claim 34 wherein said mixture of fuel gas, flue gases and air discharged into said furnace space in accordance with step (b) contains from 0% to about 100% of excess air.

36. The method of claim 34 wherein said primary portion of said fuel gas used to form said primary fuel gas-air mixture in accordance with step (b) is in the range of from about 2% to about 40% by volume of the total fuel gas discharged into said furnace space.

37. The method of claim 34 wherein said secondary portion of fuel gas used to form said secondary fuel gas-flue gases mixtures in accordance with step (c) is in the range of from about 60% to about 98% by volume of the total fuel gas discharged into said furnace space.

38. The method of claim 34 wherein said wall is formed of refractory material and is part of a refractory tile having an opening within said wall.

39. The method of claim 34 wherein a first of said alternating wall sections has a short height and slants towards said opening at a small angle, the second of said wall sections has a taller height and slants towards said opening at a larger angle and successive alternating sections have heights and angles which are the same as said first and second sections.

40. The method of claim 34 wherein said one or more deflectors attached to said alternating sections with primary fuel gas passageways formed therein are one or more deflector blocks of various shapes including triangular, rectangular, square and trapezoidal.

41. The method of claim 40 wherein said one or more deflector blocks are of triangular shapes positioned with the bases thereof coinciding with the tops of said alternating sections with primary fuel gas passageways therein and the apexes thereof pointing towards the passageways formed therein.

42. The method of claim 40 wherein one deflector block is attached to each of said alternating sections with primary fuel gas passageways formed therein.

43. The method of claim 40 wherein two or more deflector blocks are attached to each of said alternating sections with primary fuel gas passageways therein.

44. The method of claim 34 wherein said fuel gas nozzles are each connected to a source of fuel gas by separate conduits having shut-off valves disposed therein whereby said fuel gas to one or more fuel gas nozzles can be shut off when required.

45. A method of discharging a fuel gas and air mixture into a furnace space by way of an opening therein wherein said mixture is burned in a folded flame pattern and flue gases having low NO_x content are formed therefrom comprising the steps of:

(a) discharging a column of said air into said furnace space by way of a cylindrical wall which extends into said furnace space and has exterior sides divided into alternating sections having different heights and slanting towards said opening at different angles, said wall having at least one opening therein for conducting a first

portion of said fuel gas mixed with flue gases from outside said wall to within said wall;

(b) discharging said first portion of said fuel gas mixed with flue gases from said furnace space into said column of said air; and

(c) discharging said second portion of said fuel gas mixed with flue gases from said furnace space into said column of air containing said first portion of fuel gas mixed with flue gases in separate streams from locations outside said wall and adjacent to said alternating sections, said separate streams entering said column radially and burning therein along with said first portion of said fuel gas in separate folded flames surrounded by and mixed with flue gases and air and said alternating sections having passageways therein also having one or more deflectors attached thereto for deflecting said secondary portion of said fuel gas into separate streams that do not interact with each other.

46. The method of claim 45 which optionally further comprises the step of discharging a part of said first portion of said fuel gas into said column of air prior to step (a).

47. The method of claim 45 wherein said mixture of fuel gas and air discharged into said furnace space contains from 0% to about 100% of excess air.

48. The method of claim 45 wherein said first portion of said fuel gas is in the range of from about 2% to about 40% by volume of the total fuel gas discharged into said column of air.

49. The method of claim 30 wherein said second portion of said fuel gas is in the range of from about 60% to about 98% by volume of the total fuel gas discharged.

50. The method of claim 45 wherein said one or more deflectors attached to said alternating sections with primary fuel gas passageways formed therein are one or more deflector blocks of various shapes including triangular, rectangular, square and trapezoidal.

51. The method of claim 49 wherein said one or more deflector blocks are of triangular shapes positioned with the bases thereof coinciding with the tops of said alternating sections with primary fuel gas passageways therein and the apexes thereof pointing towards the passageways formed therein.

52. The method of claim 49 wherein one deflector block is attached to each of said alternating sections with primary fuel gas passageways formed therein.

53. The method of claim 49 wherein two or more deflector blocks are attached to each of said alternating sections with primary fuel gas passageways therein.

54. The method of claim 45 wherein said fuel gas nozzles are each connected to a source of fuel gas by separate conduits having shut-off valves disposed therein whereby said fuel gas to one or more fuel gas nozzles can be shut off when required.